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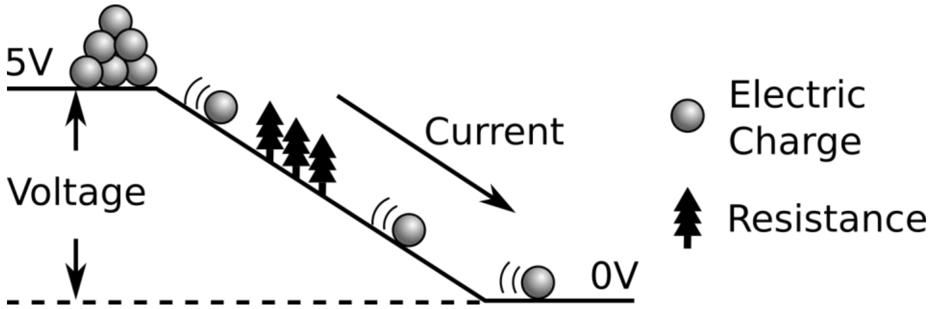
HIMALAYAN MAKERS GUILD

Activity 11 –Ohm’s Law and Resistor Values



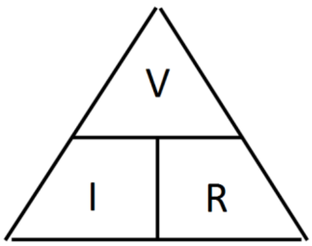
Rockslide Symbol	Electrical Property	Unit	Symbol
Height of the Hill	Voltage	Volts [V]	V
Trees	Resistance	Ohms [Ω]	R
Moving Rocks	Current	Amps [A]	I

Voltage, resistance, and current are all related to each other. For example, if we **increase voltage**, but keep the resistance the same, **current will increase**. If we **increase the resistance**, but keep voltage the same, **current will decrease**. Ohm’s Law is an equation that expresses this relationship.

Ohm’s Law

$$Current\ (I) = \frac{Voltage\ (V)}{Resistance\ (R)}$$

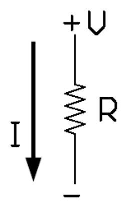
We can use this equation to calculate I, V, or R as long as we know two of them.



$$V = I \times R$$

$$I = \frac{V}{R} \qquad R = \frac{V}{I}$$

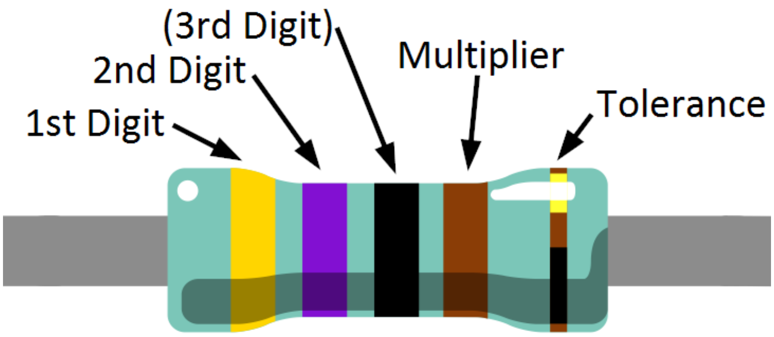
This triangle is a helpful way to remember Ohm’s Law. By covering the variable we are looking for, we can see the equation used to find it. If the two variables left are side-by-side, we multiply them. If they’re one on top of the other, we divide.



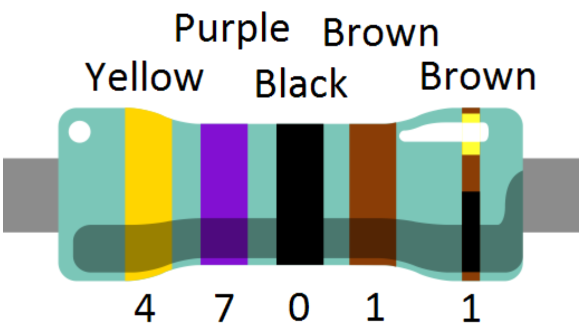
If we voltage across a resistor and we know how much current we want, we can calculate the resistor value we need.

Resistor Values

We can read the value of a resistor by looking at the coloured lines on its surface. The first 3 lines are the 3 digits of the resistor value, although sometimes only 2 lines are used. The next line is the multiplier, or how many zeros come after the digits. The last line is the tolerance, which tells us how exact the value of the resistor will be.



Color	Digit value	Multiplier	Multiplier Result	Tolerance
Silver		10^{-2}	0.01	±10%
Gold		10^{-1}	0.1	±5%
Black	0	10^{0}	1	±2%
Brown	1	10^{1}	10	±1%
Red	2	10^{2}	100	
Orange	3	10^{3}	1 000	
Yellow	4	10^{4}	10 000	
Green	5	10^{5}	100 000	
Blue	6	10^{6}	1 000 000	
Purple	7	10^{7}	10 000 000	
Gray	8	10^{8}	100 000 000	
White	9	10^{9}	1 000 000 000	



This resistor has:
digits **470**
a multiplier of $\mathbf{10^{1}}$ = 10
and a tolerance of **±1%**

So the resistor value is:
$$470 \times 10 = \mathbf{4700\ \Omega} \pm \mathbf{1}\%$$